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Hoffmann & Baron LLP
6900 Jericho Turnpike
Syosset, NY 11791

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O DELL, DAVID K	

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte DETLEF ROEDERER, DANIEL ZOLLINGER, and JEAN-YVES DE RIEDMATTEN[1]

Appeal 2014-009493
Application 12/822,770
Technology Center 1600

Before DEMETRA J. MILLS, ERIC B. GRIMES, and FRANCISCO C. PRATS, *Administrative Patent Judges*.

GRIMES, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 involving claims to a method of making 3-methyl-pyridine, which have been rejected as obvious. We have jurisdiction under 35 U.S.C. § 6(b).

We reverse.

STATEMENT OF THE CASE

"The present invention concerns a process for the production of 3-methyl-pyridine (3-picoline) . . . which is used as a solvent, for the

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[1] Appellants identify the Real Party in Interest as Lonza, Limited. (Appeal Br. 2.)

production of medicaments and insecticides as well as for the synthesis of nicotinic acid and nicotine amide." (Spec. 1:3–8.)

Claims 1, 2, 5–7, and 9 are on appeal. Claim 1 is the only independent claim and reads as follows (emphasis added):

> 1. A continuous process for the synthesis of 3-methyl-pyridine from formaldehyde, paraldehyde, ammonia and acetic acid, comprising continuously subjecting said compounds *in a jet loop reactor* to reaction conditions comprising the following parameters:
>
> h) a reaction temperature of 260-300°C;
>
> i) a molar ratio of formaldehyde and paraldehyde (calculated as acetaldehyde) of 0.7-1.4 mol/mol;
>
> j) an ammonia concentration of 10-20 weight-%
>
> k) an acetic acid concentration of 4-20 weight-%
>
> 1) a paraldehyde (calculated as acetaldehyde) concentration of 0.4-1.6 Mol/kg
>
> m) a retention time of 10-30 minutes; and
>
> n) a reaction pressure of 30-130 bar; whereby the space/time yield of 3-methylpyridine is more than 50 kg/m3*h, and the 3-methylpyridine yield is at least 64% (based on formaldehyde) and the 3-ethylpyridine yield is at most 4% (based on paraldehyde).

DISCUSSION

The Examiner has rejected all of the claims on appeal under 35 U.S.C. § 103(a) as obvious based on Dinkel,[2] Grayson,[3] and Swee Sin.[4] (Ans. 2.)

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[2] US 4,337,342, June 29, 1982

[3] Grayson et al., *An Improved Liquid-Phase Synthesis of Simple Alkylpyridines*, 67 Helvetica Chimica Acta 2100–2110 (1984).

[4] Tea Swee Sin, *A Comparative Study on the Jet Loop Reactor and Continuos* [sic] *Stirred Tank Reactor in the Selective Hydrogenation of Palm*

The Examiner finds that "Dinkel teaches the synthesis of 3-methyl-pyridine by the process of the instant claims" (*id.* at 3), although Dinkel does not teach all of the ranges recited in claim 1 and does not use a jet loop reactor (*id.*).

The Examiner finds that Grayson teaches that "the ratios of formaldehyde and paracetaldehyde [i.e., paraldehyde] were well known to affect the yield" and that "[t]emperature is known in the chemical arts to be a results effective parameter." (*Id.*) The Examiner concludes that it would have been obvious to optimize the ranges of temperature, pressure, and ratios of reagents. (*Id.* at 3–4.)

The Examiner finds that "Swee Sin discusses the use of jet loop reactors as alternatives to continuously stirred tank reactors." (*Id.* at 4.) The Examiner quotes Swee Sin's disclosure that "many researchers . . . study the feasibility of alternative Jet Loop Reactor (JLR) to replace the present conventional Continuous Stirred-Tank Reactor (CSTR) in their systems." (*Id.*) The Examiner also quotes Swee Sin's statement that "a Jet Loop Reactor (JLR) is claimed to retrofit well the CSTR and represent a very attractive alternative technology for hydrogenation process." (*Id.*) The Examiner concludes that "[b]ased on [Swee Sin], the use of a 'jet loop reactor' is an obvious choice." (*Id.* at 5.)

Appellants argue, among other things, that

> [a] jet loop reactor is known for its efficiency in gas-liquid mass transfer, and is shown to be used in Swee Sin in a three phase reaction system. The presently claimed invention however, is a

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Olein (I.V.64), Master of Engineering Thesis, Universiti Teknologi Malaysia (May 2005).

> single phase liquid system. The showing of the use (and alleged interchangeability of JLR and CSTR) of JLR in a multi-phase system is not relevant to the presently claimed single phase reaction process, nor that of Dinkel.

(Appeal Br. 8.)

Appellants argue that "there would be no motivation to attempt to use a jet loop reactor of Swee Sin in the presently claimed process because of the difference in the reaction types." (Reply Br. 1.) Thus, Appellants urge that "a sufficient motivation for a person of ordinary skill to use a jet loop reactor in the single phase system has not been established." (*Id.* at 3.)

We agree with Appellants that the Examiner has not established that it would have been obvious, based on the cited references, to use a jet loop reactor in Dinkel's process. Dinkel discloses a process of making 3-picoline by reacting acetaldehyde (which can be in the form of paraldehyde) with formaldehyde, in the presence of an ammonium salt (such as ammonium acetate), at a temperature between 180–280°C in a closed vessel. (Dinkel 1:51–60, 2:22–23.) The reaction is carried out "in the liquid phase." (*Id.* at 1:54.) Dinkel states that its process can be carried out as a continuous process and "[t]he continuous process can be carried out in any reaction [sic, reactor] which permits intimate mixing of the reactants, with vigorous stirring, for example, in a continuously-stirred tank reactor." (*Id.* at 3:7–9, 3:15–18.)

Swee Sin discloses a "study [of] the feasibility of retrofitting the conventional Jet Loop Reactor (JLR) with Continuous Stirred-Tank Reactor (CSTR) system by performing a comparative study on Jet Loop Reactor (JLR) and Continuous Stirred-Tank Reactor (CSTR) in the selective hydrogenation of palm olein [palm oil]." (Swee Sin 2–3.) The hydrogenation reaction involves hydrogen (gas), liquid palm oil, and a solid catalyst. (*Id*. at 12–13, 48–49.)

Swee Sin states that "[i]n the field of chemical and biochemical[] reaction engineering there has been an increasing interest in Jet Loop Reactor (JLR) during the last decade, because of their high efficiency in gas dispersion resulting in high mass transfer rates." (*Id*. at 33.) "The principle in this reactor type is the utilization of the kinetic energy of a high velocity liquid jet to entrain the gas phase and to create a fine dispersion of the two phases." (*Id*. at 33–34.) "The benefit of this reactor is its efficiency in gas-liquid mass transfer." (*Id*. at 2.)

Thus, Swee Sin discloses that a jet loop reactor provides high efficiency in reactions involving a gas and a liquid because it creates a dispersion of the two phases, resulting in high mass transfer rates. Dinkel, however, expressly states that its reaction takes place in the liquid phase. The Examiner has not pointed to any gas-phase reactant in Dinkel's process, nor has the Examiner provided evidence or sound technical reasoning to show that a skilled worker would have had a reason to use a jet loop reactor, specifically, in Dinkel's process. We therefore conclude that the Examiner has not shown that the process of claim 1 on appeal would have been obvious based on Dinkel, Grayson, and Swee Sin.

SUMMARY

We reverse the rejection of 1, 2, 5–7, and 9 under 35 U.S.C. § 103(a) based on Dinkel, Grayson, and Swee Sin.

<u>REVERSED</u>